

ENDANGERED SPECIES

Technical Bulletin

Department of interior. U.S. Fish and Wildlife Service
Endangered Species Program, Washington, D.C. 20240

Brown Pelicans in Southeastern U.S. Delisted After Recovering From Effects of DDT

The eastern brown pelican (*Pelecanus occidentalis carolinensis*) has recovered well enough in most of the southeastern United States from the devastating effects of DDT that the Service has removed a population of this large bird from the U.S. List of Endangered and Threatened Wildlife and Plants (F.R. 2/4/85). Brown pelicans and their habitat in Alabama, Florida, Georgia, North and South Carolina, and points northward along the Atlantic Coast are no longer given the special protection authorized by the Endangered Species Act of 1973. Within the remainder of its range, which includes coastal areas of Mississippi, Louisiana, Texas, California, the West Indies, both coasts of Mexico, Central America, and South America, where its populations are not secure, the brown pelican remains listed as Endangered and protected by the Act.

Historically, large numbers of brown pelicans nested on small coastal islands along the shores of Texas, Louisiana, Florida, and South Carolina. A smaller number nested in North Carolina, and perhaps a few in Georgia. Between 1957 and 1961, however, the pelican disappeared from the Louisiana coast as a nesting bird, and it was nearly extirpated in Texas. The suddenness and severity of this population crash suggested that a toxic substance was to blame.

It became clear that the problem was more widespread in the late 1960s and early 1970s, when brown pelican populations in South Carolina showed evidence of decreased reproduction, primarily from eggshell thinning. The decrease was similar to, although less severe than, what happened in California, where thin-shelled eggs and other complications resulted in complete reproductive failure of brown pelicans in the late 1960s and early 1970s.

Organochlorine pesticide pollution was implicated as the main cause of these population declines—endrin in Louisiana and Texas, and DDT (and its principal metabolite DDE) in California and South Carolina. These chemicals, which do not easily or quickly break down into less harmful substances, accumulated in the food chain and affected pelicans in two ways. Endrin was directly toxic to all age



Adult brown pelican and immature young at nesting site

Photo by Steve Van Riper

classes. DDE interfered with calcium deposition during eggshell production, resulting in thin-shelled eggs that too easily broke during incubation. (This problem was not unique to pelicans; DDE contamination also jeopardized other avian predators, including the bald eagle and peregrine falcon.)

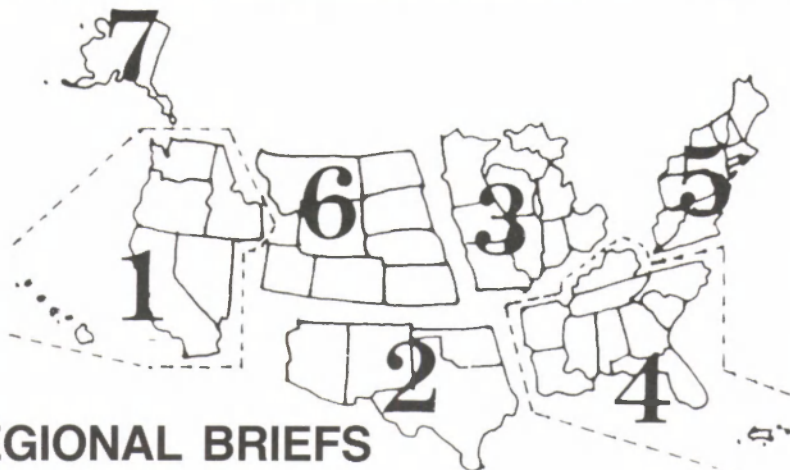
As a result of the observed declines, the threat of further declines from food supplies that were becoming increasingly contaminated, and the uncertain status of the species in other areas where contamination was anticipated, the brown pelican was listed in 1970 throughout its entire range as Endangered.

Two years later, the Environmental Protection Agency banned the use of DDT in the U.S., and the use of endrin has been curtailed. Environmental residues of these persistent compounds have been decreasing in most areas, and there has been a corresponding increase in the

eggshell thickness and reproductive success of brown pelicans and other birds. Annual population surveys now are indicating more or less stable or even increasing numbers in many areas. In fact, within the areas affected by the delisting rule, pelican populations are at or above historical levels. Further evidence of the pelican's expanding population was seen in 1983-1984, when four pairs attempted to nest on an artificial spoil island in Mobile Bay, Alabama, the first such record for that State. Accordingly, delisting was recommended by the Eastern Brown Pelican Recovery Team.

In response to the Service's November 10, 1983, proposal to remove the southeastern U.S. population of the brown pelican from Endangered Species Act protection, a total of 47 comments were received from a variety of interests, including State wildlife agencies, local gov-

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Endangered Species Program regional staffers have reported the following activities for the month of February:

Region 1—The Sacramento Endangered Species Office (SESO) staff assisted the California Department of Fish

and Game (CDFG) in conducting a winter census of the California clapper rail (*Rallus longirostris obsoletus*) in marshlands around San Francisco Bay. An airboat was used to flush rails during the highest winter tides, when almost all cover is inundated and rails are most visible. The

technique typically enables a virtually total count of rails in each marsh. With the exception of Napa Marsh, which has not been censused in more than 3 years, the CDFG censused all major marshes around the bay at least once over the past three winters. Results of these surveys indicate that the current California clapper rail population numbers only about 30 percent of previous population estimates—about 1,400–2,000 rails as compared to the 4,200–6,000 rails estimated in the mid-1970s.

Through a cooperative effort, Chevron and the SESO planted approximately 500 buckwheat seedlings during January on a remnant sand dune habitat located at Chevron's El Segundo refinery in California. The buckwheats are foodplants for the Endangered El Segundo blue butterfly (*Euphilotes battoides allyni*), which occurs on the small habitat at El Segundo and the dune system near the west end of Los Angeles International Airport. Buckwheat seeds were collected last year from mature plants at the refinery site.

Efforts to recover the Threatened Paiute cutthroat trout (*Salmo clarki seleniris*) were set back recently when it was discovered that the population in Coyote Valley Creek (Alpine County, California) is of hybrid origin. On a more positive note, however, it was confirmed recently through electrophoretic analysis that the population in Cabin Creek (Mono County, California) is of pure stock, although that stream was found from a population that contained some hybrid fish. In view of this finding, it will not now be necessary to chemically treat Cabin Creek to remove the existing population.

Region 2—Secretary of the Interior Donald Hodel has announced the Service's acquisition of the Buenos Aires Ranch near Tucson, Arizona, as a national wildlife refuge for the Endangered masked bobwhite (*Colinus virginianus ridgwayi*). This black-headed quail formerly ranged from north-central Mexico into southern Arizona. Due to widespread destruction of its habitat in the late 1800s, this bird is no longer known to occur in the wild in the United States, although small numbers survive in Mexico. The FWS plans to release captive-raised masked bobwhites this summer as part of the continuing effort to reestablish a self-sustaining wild population of the quail within the new refuge. Masked bobwhites have been successfully bred at the FWS Patuxent Wildlife Research Center in Laurel, Maryland, for several years, but the success of past releases has depended upon the amount of cover left after livestock grazing. Purchase of the ranch as a national wildlife refuge will allow the FWS to control grazing and recover the quail.

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U.S. Fish and Wildlife Service Regions

Region 1: California, Hawaii, Idaho, Nevada, Oregon, Washington, and Pacific Trust Territories. **Region 2:** Arizona, New Mexico, Oklahoma, and Texas. **Region 3:** Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. **Region 4:** Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Puerto Rico, and the Virgin Islands. **Region 5:** Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia. **Region 6:** Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming. **Region 7:** Alaska.

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Whooping cranes (*Grus americana*) of the New Mexico wintering flock and their sandhill crane (*Grus canadensis*) foster parents began moving northward into the San Luis Valley of Colorado as early as February 15. By February 25, about 17,000 sandhills had moved into Colorado. Approximately 2,500 sandhill cranes and five whoopers remained in New Mexico at that time, but they were expected to leave the Rio Grande Valley in a few days. The five whoopers remained at Bosque del Apache National Wildlife Refuge (NWR) despite the snow goose hunting under way there since February 13.

The snow goose hunt on Bosque NWR this winter was set for February 13-28 to minimize disturbance to the whooping cranes. During the 1983-84 hunting season, the snow goose hunt on Bosque NWR consisted of four 4-day hunts held in mid-November, early and late December, and mid-January. Each hunt period was followed by 10 nonhunting days. During each hunt, whoopers that had been staying on the refuge dispersed to other areas in the Rio Grande Valley and consequently were subject to greater danger from waterfowl hunters and other hazards in areas where hunting is not as closely managed.

After each hunt period on Bosque, some whoopers returned to the refuge, but the numbers were less than those present before the hunt. The peak whooper population using the refuge in 1983-84 was 13 in late November, but only 7 were present in late January after the last snow goose hunt. As a consequence of the whoopers' reaction to hunting activity, the 1984-85 hunt was scheduled entirely for mid- to late February, a time when the cranes would be preparing to migrate into Colorado. In the absence of the mid-winter hunting, opportunities for whoopers to develop pair bonds become enhanced because the birds spent most of the winter on the refuge in regular contact with other whoopers. The whooper population on Bosque NWR did respond favorably to the change in hunting patterns. The 1984-85 whooper population peaked at 16 in December and stayed at that level until early February.

It is worth noting that the wintering period is over and there was only one known whooping crane mortality in the Gray's Lake population. The cause of death is attributed to avian cholera (the first ever recorded). No other whoopers are known to be sick, which is a credit to the prompt management action of FWS refuge personnel. An avian cholera outbreak began in mid-November on Bosque NWR among snow geese and continued into February. Management measures to diminish disease losses included pumping clean water through roosting sites to dilute and wash away the cholera bacteria, knocking down corn in scattered fields to

disperse the feeding birds and to keep birds in good condition so they could resist the disease, and removal of all carcasses. About 600 snow geese, 50 sandhill cranes, and 40 miscellaneous waterfowl died in the cholera outbreak that undoubtedly would have been much worse had the FWS not promptly initiated control measures.

Arizona State University and Arizona Game and Fish Department personnel collected 2,400 razorback sucker (*Xyrauchen texanus*) larvae from Lake Mohave, Arizona. The larvae were transported to Dexter National Fish Hatchery in New Mexico to supplement the brood stock already at the hatchery. This action was taken in order to maintain the genetic diversity of this Category 2 candidate species.

Region 3—On February 19, the Eighth Circuit Court of Appeals ruled on the regulations regarding wolf management in Minnesota (see BULLETIN Vol. VIII No. 9). The court affirmed that sport trapping of wolves was illegal, reversed and remanded to the lower court the predation control regulations, and affirmed the attorney's fee award.

William Harrison has joined the Region 3 staff as the regional botanist. Bill will be responsible for coordinating all plant work in the region, including recovery plan and listing package development.

Specific population goals for Threatened and Endangered species are being established for each of the national wildlife refuges within Region 3. Similar to what the U.S. Forest Service has done on the national forests, this effort will assist the States in developing management plans for each individual species on a statewide basis.

Region 4—In late winter 1984, personnel from the FWS Asheville Endangered Species Field Station and representatives from the North Carolina Museum of Natural History discovered a small hibernating colony of Virginia big-eared bats (*Plecotus townsendii virginianus*) in western North Carolina. This Endangered species was not previously known from the State. The North Carolina Wildlife Resources Commission has received funding, through the Endangered Species Act's Section 6 grant program, for a 2-year study of the distribution of Virginia big-eared bats in North Carolina. This will be a cooperative effort among the FWS, the Museum of Natural History, and the Wildlife Resources Commission. (See story on big-eared bats on page 5.)

The FWS recently provided funds to the Virginia Polytechnic Institute's Cooperative Fishery Research Unit to study the ef-

fects of sewage treatment plant discharge on freshwater mussels. The outflows from these plants contain chlorine and ammonia, and form chloramines upon entering the receiving stream. A review of the existing literature indicates that these substances may be highly toxic to aquatic invertebrates. A field study will be conducted to determine changes in species composition, distribution, and abundance of mussels at predetermined distances below sewage treatment plants. Laboratory bioassays will test the tolerance of several mussel species to various concentrations of chlorine, ammonia, and chloramines. Results will be valuable in maintaining and recovering the diverse Endangered mussel fauna of the Tennessee River system.

One of the suspected threats to the flattened musk turtle (*Sternotherus depressus*), a Category 1 candidate species, is siltation caused by surface mining for coal. The Office of Surface Mining, which is responsible for the issuance of surface mining permits and their environmental impacts, has provided \$60,000 to help the FWS determine the impacts of surface mining on the flattened musk turtle. The FWS will conduct a study of the relationship between the distribution of these turtles and the occurrence of surface mines. Water quality analyses should provide an indication of water quality problems, and the alleviation of such problems should be accomplished by modification of surface mining procedures and/or effluent limitations. Any recommendations from this study are to become standard stipulations in all coal leasing, reclamation, and grant activities in the upper Black Warrior River Basin. These measures should contribute to the protection of the flattened musk turtle.

In early November 1984, FWS Jacksonville, Florida, Endangered Species Field Station personnel freed a female manatee (*Trichechus manatus*) that had become entangled in an oil boom line at the outflow of the Jacksonville Electric Authority's Southside Generating Plant. The female, accompanied by a large calf, was subsequently photographed to document its scar patterns, which are useful in identifying individual manatees.

In late January 1985, personnel of the FWS Sirenia Laboratory in Gainesville, Florida, censused manatees at the Florida Power and Light Company's Riviera Beach Power Plant following a severe cold front. Two hundred-thirty manatees were counted at the outflow of the power plant, among them the manatee and calf noted at Jacksonville in November. They had migrated over 300 miles from Jacksonville to Riviera Beach in about 2 months.

Proposed Endangered Status for Caribbean Plant

Zanthoxylum thomasianum, a rare evergreen shrub in danger of extinction due to its very limited numbers, was proposed recently by the Fish and Wildlife Service for listing as Endangered (F.R. 2/11/85). If the proposal is made final, this plant will receive all of the protection authorized by the Endangered Species Act of 1973.

Also known as the prickly-ash because of its sharp, brownish spines, *Z. thomasianum* is found only in seasonally deciduous vegetation formations that occur on limestone and on areas of volcanic origin in northern and central Puerto Rico, and on southern St. Thomas and St. John, U.S. Virgin Islands. Only about 1,050 individuals of this plant are known to exist, of which about 1,000 occur in a single locality. They are all threatened with extinction by potential habitat destruction resulting from limestone mining, urbanization, and road maintenance.

Z. thomasianum was first collected in 1880 on St. Thomas, Virgin Islands. In later years, it was found on St. John, Virgin Islands; at the summit of Piedras Chiquitas (a rocky outcrop between Salinas and Coamo, Puerto Rico); and along Road 155, just north of Coamo, Puerto Rico. Recently, it was also discovered in the upper part of the Guajataca Gorge in Isabela, Puerto Rico.

The largest existing population of the species consists of about one thousand individuals and is located on the southern coast of St. Thomas, east of Charlotte Amalie. About 25 individuals of *Z. thomasianum* can be found on St. John and only two are known to exist in the Guajataca Gorge area. The population at Piedras Chiquitas, partially destroyed by hurricane winds, consists of only two plants. The population along Road 155 was partially destroyed as a result of road improvement and maintenance activities, leaving only four individuals to survive.

Habitat modification and destruction appear to be the most serious threats to the species' survival, especially to the populations at St. Thomas, St. John, and Coamo. Plants at these sites are located on property that has a very high commercial value and good development potential. Subdivision and development of the land, unless done very carefully, could substantially modify or even destroy the habitat upon which *Z. thomasianum* depends. Habitat modification also threatens the population at the Guajataca Gorge site. Local residents use the area for planting yams, an activity that may result in the uprooting of prickly-ash plants. In addition, nearby limestone hills are mined for fill material. In order to offer limestone fill for sale, the hill where *Z. thomasianum* exists could be leveled to the ground, destroying every last individual.



Zanthoxylum thomasianum (prickly-ash)

Photo by Dr. José Vivaldi

Hurricanes have affected the prickly-ash in the past, and may still pose a threat to individual plants in such exposed areas as coastal hills. Other factors that add to *Z. thomasianum*'s vulnerability include the facts that the species is dioecious and the ratio of male to female plants is unknown. Since populations of the species are found in small, compact groups, some of them may be too small to guarantee the survival of a dioecious species.

Available Conservation Measures

If the listing proposal is made final, *Zanthoxylum thomasianum* will receive all the protection authorized by the Endangered Species Act. Conservation measures provided to species listed as Endangered under the Act include the increased

recognition of their precarious status, a requirement for the Service to conduct recovery actions, requirements for Federal protection, and prohibitions against interstate and international trafficking in this plant without a permit.

Under Section 7 of the Act, Federal agencies would be required to consult with the Fish and Wildlife Service to ensure that any action they fund, authorize, or carry out is not likely to jeopardize the survival of any listed species by directly affecting it or its habitat. *Z. thomasianum* is not known to occur on any Federal lands at this time, but some Federal Highway Administration (FHWA) activities may have an effect on the species. In the event that highways in areas near its habitat are widened or resurfaced, a strong commitment will be needed by the FHWA to ensure protection of the species. Road designers and work crews need to be alerted so that the plants are taken into consideration before any plans for construction of nearby roads are put into effect.

A designation of Critical Habitat for *Z. thomasianum* is not included in the listing proposal. Listing alone highlights the rarity of a species and, along with the required publication of detailed location maps that are part of such a designation, the species could become threatened by vandalism or taking.

Comments on the proposal to list this species are welcome and should be sent by April 12, 1985, to the Caribbean Islands Field Supervisor, U.S. Fish and Wildlife Service, P.O. Box 3005-Marina Station, Mayaguez, Puerto Rico 00709-3005.

Brown Pelicans

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ernments, conservation organizations, and concerned individuals.

Additionally, a petition with 281 signatures to reclassify rather than delist the pelican was received from a Florida seafood company. These comments, and the Service's responses, are summarized in the February 4, 1985, final rule.

The North Carolina Wildlife Resources Commission was among those advocating a reclassification of the brown pelican from Endangered to Threatened, thus affording it continued Endangered Species Act protection. A similar response was received from the South Carolina Wildlife and Marine Resources Department. In reply, the Service pointed out that brown

pelican numbers in the Carolinas are at or above the estimated historical levels of 10,000 breeding adults. Further, both States can give the pelican continued protection under their own endangered species legislation.

Habitat loss was not a major factor in the brown pelican's original decline, and is not expected to be a problem for this bird in the future. Most breeding colonies are on low islands that appear and disappear naturally. Also, pelicans are known to make use of such artificial islands as dredge spoil sites. Much of the current breeding habitat is under Federal, State, or conservation group management, and a variety of Federal and State coastal protection laws will continue to give some additional habitat protection. The pelican itself will continue to receive protection from take or injury throughout its range by authority of the Migratory Bird Treaty Act of 1918.

San Benito Evening-Primrose Listed as Threatened

The San Benito evening-primrose (*Camissonia benitensis*), a small, hairy annual with bright yellow flowers, has been listed by the Service as a Threatened species (F.R. 2/12/85). This plant, known from only a few sites in San Benito County, California, is jeopardized by gravel mining and off-road vehicle (ORV) use.

A 1983 survey by L. M. Kiguchi resulted in a population estimate of about 1,000 individuals, an exceedingly low number for an annual plant. They occur as scattered colonies of various sizes on serpentine alluvial terraces within the Clear Creek and San Carlos Creek drainages. The San Benito evening-primrose is highly sensitive to trampling, and it has only moderate reproductive potential even under favorable conditions.

Conditions in recent years have not been favorable. Most of the plants are at two or three sites. One of the largest and most vigorous colonies, on private land near the west entrance of Clear Creek Canyon, is being destroyed by gravel mining. The others are on public property administered by the Bureau of Land Management (BLM). Most of the likely habitat on BLM land has been degraded by heavy ORV use.

Although Clear Creek Canyon is designated by BLM as an ORV recreation area, the agency has developed a management plan intended to limit ORV damage to San Benito evening-primrose habitat. Pro-

TECTIVE fences and other barriers have been placed around all but one of the colonies on public land; however, the close proximity of camping and ORV "free play" areas to the fenced sites makes protection of the plants heavily dependent upon the voluntary compliance of ORV enthusiasts. The same difficulties also limit BLM's protection of the species within the designated "Natural Area" along San Carlos Creek.

Although BLM protection by itself does not ensure the long-term survival of the San Benito evening-primrose, recent surveys indicate that the species' numbers may be increasing at several fenced sites. The Service recognizes BLM's conservation efforts, but notes that the plant's total numbers are still relatively low. Moreover, gravel mining still jeopardizes one of the largest populations, and some ORV users may not respect the enclosures. Accordingly, the Service listed the evening-primrose, but classified it as Threatened rather than Endangered (as originally proposed on October 31, 1983). BLM's comments on the proposed listing, along with those of ORV organizations, botanists, and others, are summarized in the February 12, 1985, final rule.

Available Conservation Measures

As a Threatened species, the San Benito evening-primrose will receive the

full protection of the Endangered Species Act. Federal agencies, primarily the BLM, are now required to use their statutory authorities to assist in conservation efforts for the species, and to ensure that any actions they fund, authorize, or carry out are not likely to jeopardize its survival. For example, further development and implementation of BLM's management plan for the Clear Creek area will likely require formal interagency consultation with the Service under Section 7(a)(2) of the Act. The management plan could be written in such a way that ample protection is provided to the species without significantly reducing ORV recreation in the vicinity of Clear Creek. Non-alluvial and non-riparian areas do not provide habitat for the evening primrose; therefore, most upland areas could remain available for recreation.

The final listing rule did not include a formal designation of Critical Habitat, since pinpointing the population sites would make the species more vulnerable to vandalism; nevertheless, the plant and its habitat will receive Section 7 protection.

Among the other benefits of the listing are restrictions on interstate or international trafficking and collection of the plant on Federal lands, the requirement for the Service to develop a recovery plan, and the possibility that Federal funding may become available for California's conservation efforts for the species.

Census Technique for Endangered Big-eared Bats Proving Successful

by Fred Bagley and Judy Jacobs*

Several years ago, we began developing a recovery plan for the Ozark big-eared bat (*Plecotus townsendii ingens*) and Virginia big-eared bat (*P. t. virginianus*), Endangered subspecies of the more common Townsend's or western big-eared bat (*P. townsendii*). The Ozark big-eared bat occurs in eastern Oklahoma, northwestern Arkansas, and perhaps southern Missouri. The Virginia big-eared bat occurs in Virginia, West Virginia, Kentucky, and North Carolina.

As our efforts progressed, we became concerned with the lack of information on population trends, the lack of a standardized survey technique, and the impacts of research biologists entering active maternity colony sites. We began to wonder if it might be possible to census maternity colonies without ever entering the site. If we could come up with an accurate, yet minimally disturbing census technique, it would be possible to safely monitor population trends and evaluate the effectiveness of recovery efforts.

We thought it might be possible to count the adult female population one at a time as the bats emerged from or returned to their colony site, if they did this as a group; however, the literature on the emergence pattern of big-eareds was unclear. It was critical to the development of a survey technique to understand the emergence patterns of the species and to have some idea of how that pattern might vary as the maternity season progresses, the weather varies, and the phases of the moon change. It was also important to know the best time of the maternity season to survey the colony. If we surveyed too early, some adult females might not have arrived at the colony site; if we surveyed too late, young might have already begun to fly and their fluctuating numbers would give misleading results. And finally, it was very important to have some idea of the effect any new technique might have on the colony.

With these thoughts in mind, we set out to study nocturnal activity patterns and



Big-eared bat

seasonal population fluctuations of big-eared bats at maternity cave entrances. We observed from outside the cave with a night-vision scope, supplementing existing light with an infrared light source (provided by miner's lamps with infrared filters). With this approach, we found that, under proper lighting conditions, big-eared bats could be distinguished from

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Big-eared Bats

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other bat species by their long ears, large size, and characteristic flight pattern. We recorded data on the number of big-eared bats that flew out of the entrance, and the number that flew in, per 10-minute interval.

Field work was conducted over 39 nights at two caves (one with a gated entrance and one not gated) in Pendleton County, West Virginia, during April-July 1982. Observations took place from dusk to dawn. Unfortunately, results at the gated cave were inconclusive, due to predation on bats by a house cat at the cave entrance and an associated decrease in the population. Therefore, the following discussion is based largely on observations made at the ungated cave:

The data revealed four distinct nocturnal activity patterns, representing stages, which changed as the maternity season progressed (Figure 1). In *Stage 1* (April), big-eared bats began returning to the cave shortly after their emergence each night. Their early return was probably related to cold night temperatures and the

lack of flying insects. In *Stage 2* (mid-May to mid-June), the colony's nocturnal activity pattern was characterized by emergence from the cave over a one to two-hour period just after dark. The bats remained outside the cave most of the night and returned just before dawn. We believe that the young were born during this stage and nursed during the day.

During the third week of June (*Stage 3*), some bats began returning to the cave immediately after the completion of the emergence. This "post-emergence return" was followed by a reemergence of many of these bats. The reemergence, in turn, was followed by a gradual return of the other bats, which accelerated sharply as dawn approached. By late June, a predawn emergence interrupted the gradual return to the cave and was promptly followed by a rapid return, concluding at dawn.

The post-emergence return is likely accounted for by a small number of young that were just beginning to emerge with the adults, but were returning sooner. It seems likely that the predawn emergence was also related to activities of the young. By late July (*Stage 4*), the nocturnal activ-

ity pattern consisted of a post-emergence return of roughly one-half of the colony (completed later than in June), a predawn emergence of variable size, and a great deal of "bat traffic" in and out of the cave all night long.

Population counts revealed a 22-day period in June when the population remained stable at about 250 bats. Counts in April were lower, indicating that not all of the females had yet arrived at the colony site. Counts in May were almost 20 percent above those of June's stable time period, and may reflect the presence of transient males and/or non-reproductive females in the colony that dispersed to other areas as the maternity season progressed. By June 29, a significant number of additional big-eared bats, presumably the young, were beginning to fly and the population counts were increasing. This trend continued; our last observation in late July indicated a reproductive rate of over 0.92 young per adult. This is within the expected range, accounting for some mortality before or shortly after birth, since female bats of this species normally produce one young per season.

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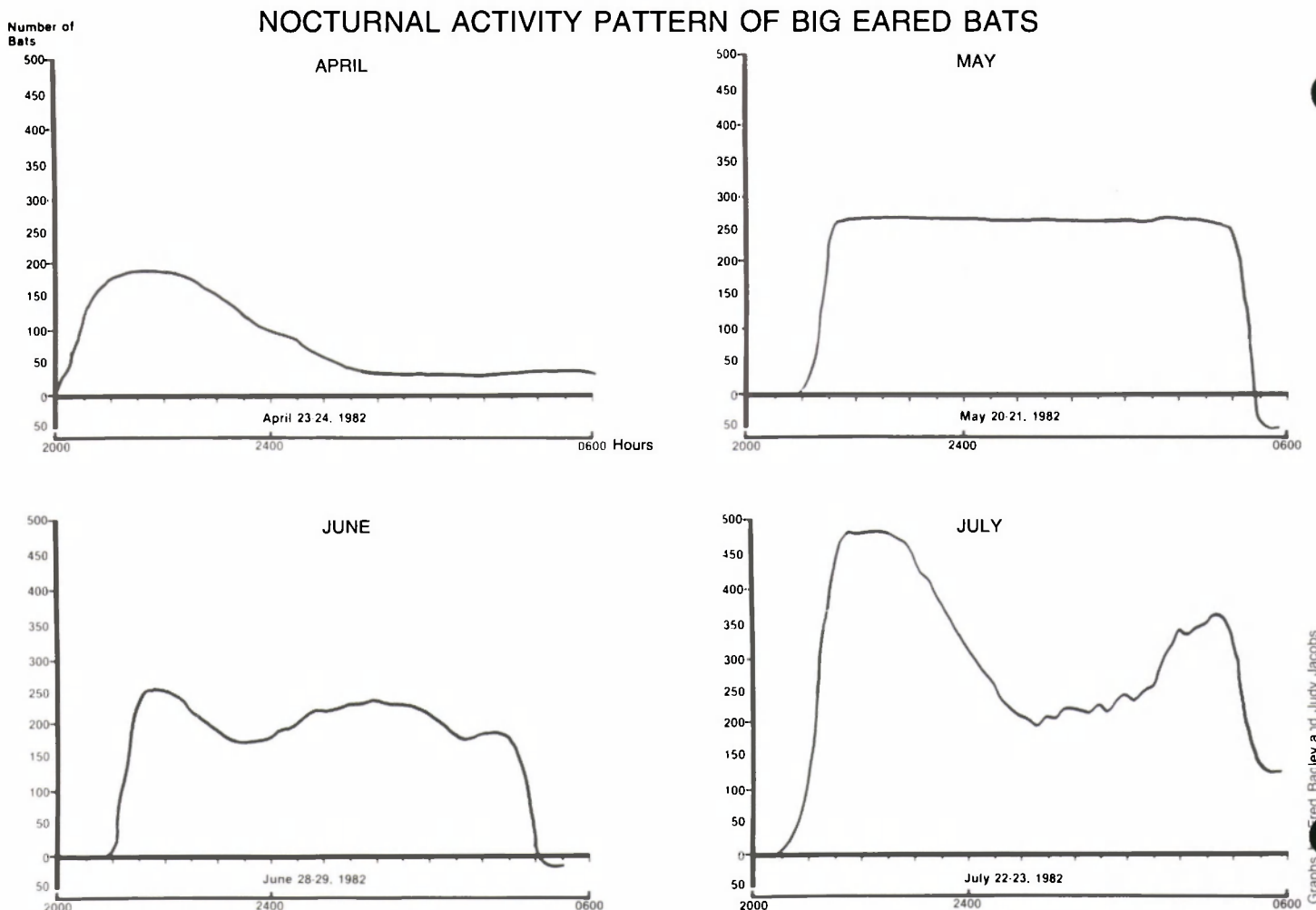


Figure 1: Four distinct nocturnal activity patterns were observed as the maternity season progressed. The slopes of the graphs indicate the net movements of the colony away from the cave (positive slope) and back to the cave (negative slope).

These observations indicate that the technique causes no abandonment, significant population reduction, or other permanent adverse effects to big-eared bat maternity colonies. The grueling all-night observations have been replaced by observing the emergence for two consecutive nights at each cave. Observations typically begin about 8:45 pm and end about 10:15 pm. This technique has been used at all big-eared bat maternity colonies for the past 2 years. The results are indicated below.

*While this work was being done, both were on the staff of the Service's Jackson, Mississippi, Endangered Species Field Station. Judy Jacobs has since transferred to the Annapolis, Maryland, Ecological Services Field Station, where she is still involved with Endangered Species Program activities.

The results of the 1984 maternity colony survey (the second of four planned annual surveys) for Ozark and Virginia big-eared bats are now available. This effort was coordinated by the Jackson Office, and was conducted by Federal, State, and private personnel in Regions 2, 4, and 5.

For Virginia big-eared bat maternity colonies, the 1984 survey indicated there were population increases at six caves, a decrease at one cave, and no change at two caves (in comparison with 1983). Overall, this represents a 10 percent increase in the population at known maternity colony sites (1983, 3505 bats; 1984, 3866 bats). The survey also identified two maternity colony sites and two bachelor colony sites in Kentucky in 1984; how-

ever, the Kentucky data are not included in this report, since these caves were surveyed too late in the maternity season to provide comparable data.

For the Ozark big-eared bat, there was an overall 9 percent decline in populations at the three known maternity colonies between the 1983 and 1984 surveys. Two of the three previously known maternity colonies declined in 1984. However, the discovery of two additional colonies in Oklahoma in 1984 resulted in an overall increase (24 percent) in the number of known Ozark big-eared bats (1983, 311 bats; 1984, 386 bats).

RECOVERY PLAN NEWS

Approved Plans for Four Puerto Rican Species

Four Threatened or Endangered species endemic to islands within the Commonwealth of Puerto Rico are subjects of recovery plans that were approved by the Fish and Wildlife Service (FWS) on April 19, 1984. With the help of these plans, prepared by Mr. Carlos A. Diaz Diaz of Puerto Rico's Department of Natural Resources, all four species may have a better chance of regaining a secure status.

Two Mona Island Reptiles

The *Mona boa* (*Epicrates monensis monensis*) and the *Mona ground iguana* (*Cyclura stejnegeri*) are both broadly distributed throughout Mona Island, a rocky limestone island located midway between Puerto Rico and Hispaniola in the Greater Antilles. Most of Mona Island is a very flat plateau, covered by outcrops of solid limestone and dominated by a dry, semi-deciduous scrub vegetation of low trees and shrubs interspersed with cacti. On other parts of the island, a thin soil layer permits tree growth in cracks, crevices, and soil pockets. As a result, the tree canopy is low and discontinuous. Along the southwestern coastal terrace, deeper soils support a more closed-canopy forest.

A nonvenomous snake that belongs to the Boidae family, the Mona boa grows to about one meter long and has a light brown body with dark brown markings. Little is known about the species' feeding habits, but anoles are thought to constitute an important part of its diet, as well as rats, mice, and bats. Only about 12 individuals of this extremely rare reptile are known to exist, all of them on Mona Island.

Because the Mona boa is a nocturnal species and exists in a spiny-vegetation environment, it may be difficult to locate. Since past and current population levels and trends are not known for certain, it is difficult to determine whether or not the species has been significantly reduced in numbers. If numbers have declined, however, the most probable cause would be the introduction of exotic mammals (goats, pigs, and cats) to the island. Goats and pigs have modified many of Mona Island's plant communities by overbrowsing and uprooting the vegetation, which has disturbed the boa's habitat. Cats are feral throughout the island and are thought to prey on the snake. A decrease in the island's bat population, a source of food for the boa, is considered another possible cause of its decline.

The Mona ground iguana is the largest lizard in the Commonwealth of Puerto Rico. This reptile measures close to 3.4 feet long, has a heavy body, a large head, and a stout, laterally compressed tail. The general color of this species is olive or olive-gray, sometimes with brown and/or blue lines. It has a dorsal crest extending from head to tail and a small horn on the snout (just in front of the eyes).

Although the iguana occurs throughout Mona Island, it is most commonly found along major escarpments and cliffside talus slopes, and less common on the southwestern coastal plain (except during the summer nesting season). The escarpments provide many retreats and a great variety of food, while the southwestern plain does not provide these conditions. However, because the plain is the only portion of Mona Island with soils deep enough for iguana nesting, gravid females migrate great



Photo by Thomas A. Wiewandt

Only about 12 individuals of the nonvenomous Mona boa are known to exist.

distances in search of favorable nesting sites there.

Cyclurid iguanas are known to be herbivorous-omnivorous. They forage mostly on the ground, although some individuals climb as far as 3 meters up onto shrubs to eat leaves. Land crabs

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Mona Island Reptiles

(continued from page 7)

and insect (coleoptera and lepidoptera) larvae are its most common animal food items. All the plant species eaten by iguanas are also eaten by goats, with the exception of a poisonous coastal plant, *Hippomane mancinella*, which is consumed by iguanas in limited quantities. The competition for food with exotic goats is thought to be one of the major threats to the Mona iguana's existence, along with the same threats posed to the Mona boa by introduced mammals. Hunting, certain agricultural and forestry practices, and some recreational activities are also responsible for *C. stejnegeri*'s declining population.

The Department of Natural Resources of the Commonwealth of Puerto Rico has managed Mona Island since 1973, protecting its wildlife and vegetation, but there have been no direct conservation efforts for either the Mona boa or the Mona iguana. On February 3, 1978, the FWS listed both species as Threatened and designated Mona Island as their Critical Habitat.



Mona iguana

Recovery Actions

The recovery plans for both species propose to bring the populations of the boa and the iguana to levels where they are again stable, self-sustaining members of their ecosystem. The lack of information on population levels and trends for these species precludes the formulation of specific, reliable figures to determine when the populations are recovered. However, both the Mona boa and the Mona iguana probably can be considered recovered when their populations increase or stabilize during a 5 to 10-year period.

As a first step, surveys and long-term monitoring should be conducted to determine if the populations are currently stable, growing, or declining. Studies of

their feeding and breeding habits, as well as the effects of introduced mammals on Mona Island, will also contribute toward the goal of recovery for these two species. The study of feeding habits, in particular, may prove crucial. For example, it has already been determined that the Mona boa and feral cats both feed on anoles, and that the Mona iguana and feral goats feed on the same plants. This competition for food should be accurately assessed.

The interaction between exotic mammals and the Mona boa and iguana should be studied closely to aid in these reptiles' recovery. If proven a hazard, populations of feral mammals threatening the boa and iguana should be effectively controlled or eradicated, where feasible. It should be noted, however, that if eradication of cats, pigs, and/or goats is considered a prerequisite in determining the Mona boa and iguana as recovered, complete recovery and delisting may never be achieved. Eradication of feral mammals has proven successful in some areas (e.g., New Zealand), but difficult or impossible in

others (e.g., the Hawaiian Islands). The vegetation, climate, and topography prevalent on Mona Island would make such eradication an exceptionally difficult task. In the meantime, by enforcing current regulations on the island, the populations of both species will receive protection.

Golden Coqui

The golden coqui (*Eleutherodactylus jasperi*) is the only frog species in the family Leptodactylidae that is known to give birth to live young. It measures between 19 and 22 mm in total length and is olive-gold to yellow-gold in color. Endemic to Puerto Rico, this unique amphibian is restricted to a small area south of Cayey. It can be found on



Photo by George Drewry

Bromeliads are a critical element of the golden coqui's habitat.

mountain tops, from 700 to 850 meters in elevation, at Cerro Avispa, Monte el Gato, and Sierra de Cayey where it rests on dense clusters of bromeliads growing on trees, rock edges, and the ground.

Dense bromeliad growth appears to be a critical factor in determining the presence of golden coqui populations. Frog-inhabited plants usually occur in clusters, indicating that dispersal distances tend to be short. Because of moderate rainfall and temperatures, the lands on which the coqui thrives are in great demand for agricultural development and other related purposes. Consequently, these activities represent the principal threat to the species' survival. In addition to the threats caused by loss of habitat, *E. jasperi* is also threatened by an apparently low reproductive rate, the potential for overcollecting, and its seeming inability to disperse widely.

There are no data to document an actual decline of the golden coqui population, but since the general area encompassing the species' habitat burned some years ago, some loss can reasonably be presumed. The only available estimates are those developed during a field investigation between May 1973 and August 1974, which estimated a population of fewer than 10 individuals for Cerro Avispa, 500–1,000 for Monte El Gato, and 1,000–2,000 for Sierra de Cayey. A better determination of its current status can allow for a more accurate assessment of future population trends and management needs.

Eleutherodactylus jasperi was listed as Threatened with Critical Habitat on November 11, 1977. No additional conservation measures beyond the legal protection authorized by the Endangered Species Act have been taken for the species.

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Recovery Actions

The recovery plan for the golden coqui sets out to bring the population of the species to levels at which it is secure and can safely be delisted. A stable population of the coqui is considered to be a minimum of 1,000 individuals in each of its three known locations. This population level would provide a measure of protection against any catastrophic events (e.g., fires, hurricanes) that may otherwise eliminate the reduced population.

One of the most important steps toward recovery of *E. jasperi* is to protect existing populations. Any destruction or modification of the coqui's known habitat should be curtailed to maintain current population levels. Conservation of nearby areas is also important because it provides buffer zones from human disturbance. Since the golden coqui's habitat is located on private lands, protective measures such as conservation agreements, easements, land exchange, and land acquisition should be evaluated and the most appropriate alternatives negotiated. As an immediate measure, landowners should be contacted and encouraged to conserve as much habitat as possible. Once certain areas are secured, an interim management plan should be prepared for these areas.

The recovery plan also emphasizes the need for research on the biology of *E. jasperi*. Information on the breeding season, brood size, growth rate, longevity, and mortality of the species is essential to formulate an effective management strategy. Data on foraging behavior and food availability are also needed for aid in evaluating potential habitat sites and for assessing modification of known habitat. Equally as important, population surveys conducted periodically will aid in evaluating the effectiveness of recovery actions.

Puerto Rican Whip-poor-will

The Puerto Rican whip-poor-will (*Caprimulgus noctitherus*) is a robin-sized, nocturnal bird that lays its eggs on leaf litter under a bush. It can be identified by its fluffy plumage mottled with dark brown, black, and gray, a white band across its throat, and white spots at the end of its tail feathers. In the past, the Puerto Rican whip-poor-will probably occurred throughout the limestone forests of Puerto Rico, but now it is restricted to three dry semi-deciduous areas in the southwestern areas of the island: Guanica State Forest, Susua State Forest, and Guayanilla Hills. The largest population is in the Guanica State Forest where, in 1973, 400 breeding pairs were estimated to survive. The

other two populations were estimated at 100 pairs at Susua State Forest and 50 pairs at Guayanilla Hills.

The introduction of the mongoose (*Herpestes auro-punctatus*) to Puerto Rico in 1877 may be the main cause of the species' decline. Presumably, mongoose predation on *C. noctitherus* caused the bird's extirpation from the lowland moist limestone forest—an area having enough water to support mongooses. On other islands (Fiji, St. Croix, St. Thomas), mongooses have decimated many species of reptiles, amphibians, and ground nesting birds by preying upon them and their eggs. In the Virgin Islands, mongooses have contributed to the decline of the Endangered St. Croix ground lizard (*Ameiva polops*) and the probable extinction of the St. Croix ground snake (*Alsophis sancticrucis*).

The Puerto Rican whip-poor-will is estimated to survive in only about 3 percent of its former range, or only 0.7 percent of the total land surface of the island. Puerto Rico's expanding human population is a continuing threat to the remaining habitat.

On June 4, 1973, the Fish and Wildlife Service designated the Puerto Rican whip-poor-will as Endangered throughout its range. Until that point, the only other measures taken to conserve the species were the protection given to forest reserves by government laws that assured minimum habitat modification in these areas, and Law 70 of the Com-

monwealth of Puerto Rico, which protects all native wildlife.

Recovery Actions

The recovery plan for this bird emphasizes the need to obtain and refine basic data on current population levels, habitat, and other factors that may be limiting population expansion. Since 1973, no new information concerning population densities of this species has become available. Until better information is available, the whip-poor-will tentatively can be considered recovered when a population of 600 breeding pairs exists in Guanica Forest, 400 pairs in the Guayanilla Hills area, and 200 pairs in Susua Forest. In addition, there must be an assurance of long-term protection for the essential habitat needed to sustain these populations.

Put simply, the best recovery strategy for the whip-poor-will is habitat protection, especially in Guanica and Susua State Forests where conservation officers can patrol areas as needed. The FWS may ultimately have a role in ensuring protection of the essential habitat that is privately owned in the Guayanilla Hills area. Potential habitat protection measures, such as easements, conservation agreements, zoning regulations, and land acquisition or exchange, will be considered. In the meantime, private landowners should also be contacted and encouraged to protect habitat on their land.

Four San Marcos River Species

The San Marcos River begins at a series of springs along a fault zone in the City of San Marcos, Texas. Although their flows have varied over the years with fluctuations in their source, the Edwards Aquifer, the San Marcos Springs have never been known to go dry. Their uninterrupted flows, high water quality, and constant water temperature may account, at least in part, for the fact that the San Marcos Springs and River ecosystem has a greater known diversity of aquatic organisms than any such ecosystem in the region. Many of these species are found nowhere else, and now are restricted to the first few kilometers or less of the spring run.

Due to a variety of factors, including depletion of the aquifer for human uses, pollution, and alterations in the river corridor for recreation and other purposes, the San Marcos River is in danger of losing its unique biological resources. Currently, three animals and one plant native to the San Marcos ecosystem are listed by the Fish and Wildlife Service as Endangered or Threatened:

San Marcos gambusia (*Gambusia georgei*)—Due to its rarity, little is known



Photo by B. G. Whiteside

San Marcos gambusia

about this small (25 to 40 millimeter standard length) fish, the most imperiled of the four listed San Marcos species. Currently, the San Marcos gambusia is thought to occur in very small numbers only within an approximately one-kilometer stretch of the upper river. Its habitat needs apparently are quite specific: thermally constant flows; quiet shallow, open waters adjacent to sections moving more rapidly; a muddy, but generally not silted, substrate; partial shading from the sun; and high water quality. Any significant changes in these natural ecological conditions could result in the extinction of this species, which is classified as Endangered.

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San Marcos

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Fountain darter (*Etheostoma fonticola*)—This small (25 millimeter standard length), mostly reddish brown fish has a distinctive dorsal fin with black, red, and clear bands. Like the San Marcos gambusia, the fountain darter needs clean, clear water of consistent temperature; however, it also requires vegetated stream bottoms, preferably with mats of filamentous green algae (*Rhizoclonium* sp.) that it uses for cover.

The fountain darter is known from the San Marcos River and another Edwards



Photo by Robert Edwards

Fountain darter

Aquifer spring discharge, the Comal River. It was extirpated from the latter during the 1950s, due primarily to temporarily reduced flows, but a small population has been reestablished by reintroduction. Since the Comal River is only 5 kilometers in total length and has been known to periodically cease flowing, it does not comprise much of a "safety valve" for the species, and the San Marcos River ecosystem must be conserved if the fountain darter is to survive and recover. Since there are two small populations, however, this fish is listed as Threatened rather than Endangered.

San Marcos salamander (*Eurycea nana*)—This short (up to 59.6 mm total length), slender amphibian is colored light tan on its back, but it can alter its dorsal coloration to dark brown, and back again, in accord with the darkness or lightness of its substrate. A lungless species, the San Marcos salamander retains its gills and does not leave the water to metamorphose into a terrestrial form.

Data on the salamander's historical range are unclear. Currently, this Threatened species is known to occur only in Spring Lake, an unusual 40-acre impoundment formed when flows from the San Marcos Springs were dammed in the late 1800s. Most individuals are located in the northernmost section of the lake, on a limestone shelf immediately in front of the lakeside Aquarena Springs Hotel. There, concrete banks in front of the hotel and limestone boulders in adjacent shallow waters support a lush growth of the aquatic moss *Leptodictyum riparium* and mats of a coarse, filamentous blue-green alga (*Lyngbya* sp.). In view of the abun-

dance of predators (primarily fish, but also crayfish, turtles, and aquatic birds) in Spring Lake, such protective cover is essential to the survival of the salamander. A plentiful food supply for the salamander also is harbored by the aquatic vegetation.

Texas wildrice (*Zizania texana*)—Texas wildrice is an aquatic grass that forms large clones or masses firmly rooted in the river's gravel bottom. The culms and leaves usually are immersed and long-streaming in the swift current. (The species is not found in slow moving or stagnant water.) In former times, when Texas wildrice was more abundant and less subject to human disturbance, the flowering tops of the plants projected as much as a meter above the water. Today, however, flowering plants are rarely seen, and when present, do not extend very far above the surface. Since no seedlings have been observed in the native San Marcos River habitat, it is unknown whether or not the Texas wildrice can any longer reseed itself, given its low numbers and the continuing threats to its ecosystem. Accordingly, it is classified as Endangered.

Dr. W. H. Emery of Southwest Texas State University in San Marcos has worked with the Texas wildrice since at least 1975, and has had success in seed collection, seed storage and germination, seedling survival, and development of survival clones to the F₂ generation through pollenization under controlled conditions. His attempts to transplant clones of nursery-grown plants into the wild met with some temporary success. Unfortunately, however, long-term survival was prevented by factors including flooding, predation by an exotic rodent (nutria), and some recreational users of the San Marcos River who damaged the plant's fruiting heads.

Threats to the Ecosystem

Aside from their specific microhabitat needs, all four of the listed species in the San Marcos River ecosystem require an uninterrupted water supply that is clean, clear, free-flowing, and thermally constant. Any significant changes in these conditions will make the recovery effort difficult, if not impossible, and could even result in extinction. Therefore, the *San Marcos River Recovery Plan* is being treated by the Service as a *habitat* recovery plan. If the stream is conserved, it is likely that the species will survive.

Because the San Marcos Springs and River ecosystem is inextricably tied to the condition of the Edwards Aquifer, increased use of the groundwater is cause for concern. A steady growth in the human population is expected for the foreseeable future, and the Texas Department of Water Resources predicts that groundwater pumping will increase well into the 21st century. Data from the U.S.

Bureau of Reclamation suggest that future demands on the aquifer will far exceed its ability to recharge. The recovery plan cites numerous predictions that, unless steps are taken to conserve the aquifer's water supply, "the flow from the San Marcos Springs will cease around the year 2000." The implications for all aquatic life in the San Marcos ecosystem, not just for the listed species, are obvious.

The quality of the remaining water faces the same threats posed by rapid urbanization in many other areas, including the problems of occasional pollution from overloaded sewage treatment facilities, erosion and siltation, and flooding caused by uncontrolled runoff. Locally applied herbicides and pesticides also may be having unanticipated effects. For example, the Texas Highway Department has used the herbicide "Roundup" for grounds maintenance around a bridge that crosses the San Marcos River. Rainfall could easily wash this chemical into the type locality of the San Marcos gambusia. Although the effects of this substance on the four listed species are not known, it may be more than coincidental that no San Marcos gambusia have been detected at its type locality since the spraying program was initiated.

At least 10 species of introduced fishes have been detected in the San Marcos River, and some are particularly abundant. These exotics may be preying on the native fishes, out-competing them for food and territory, and spreading introduced parasites.

The Texas wildrice, which occurs within the city limits of San Marcos, faces some special problems. In 1967, Emery discussed the damage being caused by the following activities: the mowing of aquatic plants at Spring Lake to make the water more attractive to tourists, which sent masses of cut vegetation downstream and damaged the emergent wildrice inflorescences; the periodic harrowing of the river bottom to remove vegetation; the introduction and commercial harvesting of aquatic plants; the collection of native aquatic plants; and the raw sewage discharged into the water whenever the city's sewage treatment capacity was exceeded. Ten years later, Emery noted that the impacts of these factors had abated significantly but the wildrice had not been able to recover by producing new plants. The population declined even further during a 1980 flood, which swept away many of the clones and physically altered the river channel. Since the Texas wildrice seems to be particularly sensitive to chemical changes in the water, application of herbicides (such as the "Roundup" mentioned earlier) could be taking a toll.

Planned Recovery Efforts

The overall objective of the *San Marcos Recovery Plan* (approved 12/3/84) is to

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San Marcos

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ensure the long-term conservation of the San Marcos Springs and River ecosystem, which should enable the four listed species to eventually regain a secure status. Concurrently, some specific research and management activities will be necessary, particularly for the gambusia and the wildrice.

In order to assess population trends and the effectiveness of recovery actions, each of the four species must be monitored on a regular basis. For the San Marcos gambusia and the Texas wildrice, which are in the greatest danger, surveys should be conducted at least quarterly during the initial phases of the recovery program. Populations of the fountain darter and San Marcos salamander, species in a relatively more stable condition, should be monitored twice or more per year. As recovery activities progress, these schedules could be modified.

A better knowledge of the biological and ecological factors influencing the protected species is important for developing the most effective management approaches. For example, the Service believes that the relatively large number of potential predators and competitors artificially introduced into the San Marcos ecosystem is having an effect on the native species, but the severity of this threat is not clear. Research into the impacts of exotic species could provide guidance as to whether control procedures should be initiated or whether the available resources should first be concentrated on more critical problems. Basic information is needed in a number of other areas, including diseases and parasites, conditions for reproductive success, survivor-

ship patterns, and aquatic habitat characteristics.

Maintaining a healthy San Marcos ecosystem will be possible only as long as the Edwards Aquifer is not depleted. Numerous State and Federal agencies, including the Edwards Underground Water District, Edwards Aquifer Research and Data Center (EARDC), Texas Department of Water Resources, U.S. Geological Survey, U.S. Army Corps of Engineers, Bureau of Reclamation, Soil Conservation Service, and the Fish and Wildlife Service, have conducted and are continuing to conduct studies on the characteristics and functioning of the aquifer. More data are needed, however, on factors that are likely to affect the uninterrupted flow of the San Marcos Springs. Dr. Albert Ogden, of the EARDC, with support from Region 2 of the Fish and Wildlife Service, has collected preliminary data indicating that flows from the San Marcos Springs could be maintained by local natural recharge, augmented by construction of artificial recharge structures.

Without the cooperation of all agencies involved with managing use of the aquifer, recovery of the San Marcos species is remote. Any controls on groundwater pumping or requirements for water conservation would be imposed only with the concurrence of the involved local, State, and Federal agencies. The Fish and Wildlife Service and the City of San Marcos believe that conserving the San Marcos River ecosystem can, and must be, compatible with carefully managed human uses of the water. San Marcos has taken a strong initiative in protecting the river. Since the Edwards Aquifer is the main water supply for the cities of San Marcos, San Antonio, and several other cities in southcentral Texas, it obviously is

in the interests of area citizens to ensure that the aquifer does not run dry or become contaminated.

Although the San Marcos ecosystem is primarily a springrun, surface run-off from the surrounding watershed strongly influences the aquatic habitat. As urbanization increases, greater water quality problems can be expected unless measures are taken to handle stormwater and street run-off, occasional spills from the sewage treatment plant, and other sources of wastewater. Pollution from herbicides and pesticides, if found to be a threat, also will have to be addressed.

Because their numbers are so low and their habitat so restricted, the San Marcos species could be extirpated by a single catastrophic event, such as a chemical spill. As a precaution, the recovery plan advocates establishing captive populations for future use in restocking. Such a program would begin with the gambusia, which is in the greatest peril.

"Tubing," canoeing, swimming, and other forms of recreation are becoming increasingly popular along the San Marcos River. The combined impacts of these activities on the ecosystem are unknown; however, at least part of the reproductive difficulties suffered by the Texas wildrice can be traced directly to people knocking over and damaging the plant's emergent seed heads. Recreational use patterns should be documented, particularly as they relate to the wildrice flowering season, so potential management alternatives may be drawn to accommodate both recreation and conservation.

Once conservation of the San Marcos Springs and River ecosystem is ensured, and studies show that the rare animals and plants are responding favorably, reclassifications or delistings can be considered.

Regional Briefs

(continued from page 3)

During fall 1984, the Florida Department of Transportation (at the urging of the Federal Highway Administration), in cooperation with the FWS and the Florida Game and Fresh Water Fish Commission, installed four American crocodile (*Crocodylus acutus*) warning signs along State Road 905 (Card Sound Road) and U.S. 1 at North Key Largo in the upper Florida Keys. Since crocodiles are periodically hit by cars, the signs are intended to alert motorists to crocodiles crossing the highways. The first set of signs was stolen soon after installation but then replaced.

The crocodile population has steadily declined. In recent years, 15 crocodiles, ranging in size from 1.5–9 feet long, have been killed by motor vehicles. At present, approximately 100–400 adults remain, including only 20 breeding females.

The Discovery Island Zoological Park at Walt Disney World in Lake Buena Vista, Florida, reported discouragingly low reproductive success in its 1984 dusky seaside sparrow (*Ammodramus maritima nigrescens*) hybridization project. Only three dusky males remain, and all are approaching 10 years of age. A 75-percent dusky/25-percent Scott's seaside sparrow (*A. m. peninsulae*) female made five nesting attempts and produced eight eggs. One egg hatched and the young bird fledged, but was found dead with a broken neck in its cage in early September. A 50-percent female made seven nesting attempts and produced 20 eggs, of which five hatched. Only one hatchling survived (75-percent dusky), which will be used in the 1985 breeding program.

Proposed modifications to an existing U.S. Army Corps of Engineers drainage/flood control project in south Florida will affect Critical Habitat for the Endangered Cape Sable seaside sparrow (*Ammo-*

spiza maritima mirabilis). One aspect of the changes that are being considered would restore a more natural hydrologic regime to 20,000–30,000 acres of wetlands, which includes several thousand acres of Critical Habitat, and it is quite possible that this wetland restoration could adversely modify the sparrow's Critical Habitat. The same area is concurrently designated as Critical Habitat for the American crocodile (*Crocodylus acutus*), which will likely benefit from the proposed restoration.

The Habitat Evaluation Procedures (HEP) developed by the FWS are being studied as a technique for more detailed definition of habitat quality and to assist in predicting post-project conditions. This project, which may also affect the Endangered wood stork (*Mycteria americana*), emphasizes the liabilities and implications of single species management as a tool in recovery of listed species.

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Changes in Research Publications

Beginning early in 1985, the Fish and Wildlife Service is revising the titles, content, and format of the following Research and Development publications:

The series *Wildlife Leaflet* will be renamed *Fish and Wildlife Leaflet*. Two other series, *Research Report* and *Research Report—Wildlife*, are being combined under a new title, *Fish and Wildlife Research*. The *Technical Papers* and *Special Scientific Report—Wildlife* series will be consolidated into the *Fish and Wildlife Technical Reports*. All of the above will include fisheries as well as wildlife topics. *Fisheries and Wildlife Research*, an unnumbered annual report, has already been retitled *Fisheries and Wildlife Research and Development*, and the *FWS/OBS* series will be retitled *Biological Reports*.

Further information on these publications is available from the Editorial Office, U.S. Fish and Wildlife Service, Aylesworth Hall, Colorado State University, Fort Collins, Colorado 80523.

BOX SCORE OF LISTINGS/RECOVERY PLANS

Category	ENDANGERED			THREATENED			SPECIES* TOTAL	SPECIES HAVING PLANS
	U.S. Only	U.S. & Foreign	Foreign Only	U.S. Only	U.S. & Foreign	Foreign Only		
Mammals	20	19	234	4	0	22	299	22
Birds	59	13	144	3	1	0	220	54
Reptiles	8	6	60	8	4	13	99	15
Amphibians	5	0	8	3	0	0	16	6
Fishes	30	4	11	14	3	0	62	37
Snails	3	0	1	5	0	0	9	7
Clams	22	0	2	0	0	0	24	18
Crustaceans	3	0	0	1	0	0	4	1
Insects	8	0	0	4	0	0	12	9
Plants	67	5	1	10	2	2	87	34
TOTAL	225	47	461	52	10	37	832	203**

* Separate populations of a species, listed both as Endangered and Threatened, are tallied twice. Species which are thus accounted for are the gray wolf, bald eagle, American alligator, green sea turtle, Olive ridley sea turtle, and leopard.

** More than one species may be covered by some plans, and a few species have more than one plan covering different parts of their ranges.

Number of Recovery Plans approved: 169

Number of species currently proposed for listing: 31 animals
37 plants

Number of Species with Critical Habitats determined: 68

Number of Cooperative Agreements signed with States: 41 fish & wildlife
16 plants

February 28, 1985

Regional Briefs

(continued from page 11)

In an even job trade, Marshall P. Jones has taken over as chief of the Region 4 Endangered Species Office, and Alex B. Montgomery has switched with Marshall to become Regional Planning Coordinator. Marshall had previously worked as coordinator of listing in the regional office and before that held a variety of jobs in the Washington Office of Endangered Species, including the job as first editor of the BULLETIN. Alex, who has been the Regional Endangered Species Office chief since 1976, will now be responsible

for coordination of regional resource planning for all FWS programs, as well as State comprehensive planning under the Federal Aid Program.

Region 5—New York State biologists have recently discovered a new Indiana bat (*Myotis sodalis*) hibernaculum in an abandoned mine. Approximately 3,400 of these Endangered bats were found hibernating in this newly discovered shelter.

Region 7—Endangered species biologists Skip Ambrose and Michael Amaral presented papers at the raptor session of a conference and workshop on Alaska

birds held recently in Anchorage. Skip summarized peregrine falcon (*Falco peregrinus*) studies conducted in Alaska from 1979–1984. Mike reported on the cliff-nesting birds of prey along the Canning and Kongakut Rivers, and compared the nesting density of birds along ten major Alaska rivers. Abstracts of the more than 50 papers presented at the conference will be published later. The conference was sponsored by the Alaska Department of Fish and Game, the National Audubon Society, the University of Alaska, the Bureau of Land Management, the National Park Service, the U.S. Forest Service, and the Fish and Wildlife Service.

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ENDANGERED SPECIES

Technical Bulletin

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